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The innovation equation: balancing clever technical solutions with users' needs

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Abstract

Finding clever technical solutions to clearly defined problems is just one half of the process of innovation. Innovation also includes identifying customers' sometimes well-concealed needs. If we can think of those factors associated with technology and those associated with user needs as being different terms on either side of a mathematical equation, innovation is the process of balancing the equation in a way that allows a clever solution to equal customers' needs. This paper explores the details of how important work on both sides of the equation resulted in the creation of a new sports training market that, prior to 1986, had not yet been fully contemplated.

Keywords: innovation; power; SRM; Power-Tap;

1. Introduction

Henry Ford once famously stated: "If I had asked my customers what they wanted, they would have said a faster horse." As an innovator, do you give customers what they say they want or do you give them what you think they need - even if they do not yet know they need it? What we say, think, do, use, know, feel, and dream defines a spectrum of user needs that extends from those that are plainly explicit on one end of the continuum to those that are ethereally latent on the other [1]. Your customer may tell you exactly what he wants and you may wish to deliver exactly on that explicitly stated want. Delivering on explicitly stated wants is fairly easy so the fulfillment of that want is more easily duplicated and the gains may be small. On the other hand, your customer may not have a way to tell you what he feels or dreams about his needs. Identifying and delivering on these well-concealed, latent needs is not so easy and is less likely to be duplicated so the gains may be larger. Layered on top of finding and defining users' needs is the development of the technical solution to meet users' needs, which has its own set of difficulties in realization. So, what is innovation and how do you know you are innovating?

Let us start with a definition of innovation. A simple explanation of innovation may be: "new stuff that is made useful" [2]. Notice the word "useful". Innovation is not just a clever technical solution that has been projected forward to a highly-refined, physical or intellectual expression. This is just one side of the equation. Innovation is the balance of meeting users' needs with a clever technical solution. Simultaneously answering the questions: "Should we do this?" and "Can we do this?" in the affirmative and then answering the more subtly nuanced

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questions: "Why should we do this?" and "How can we do this?" is what leads to innovative solutions. An illustration of how the process of innovation relates to these questions is presented in Figure 1.

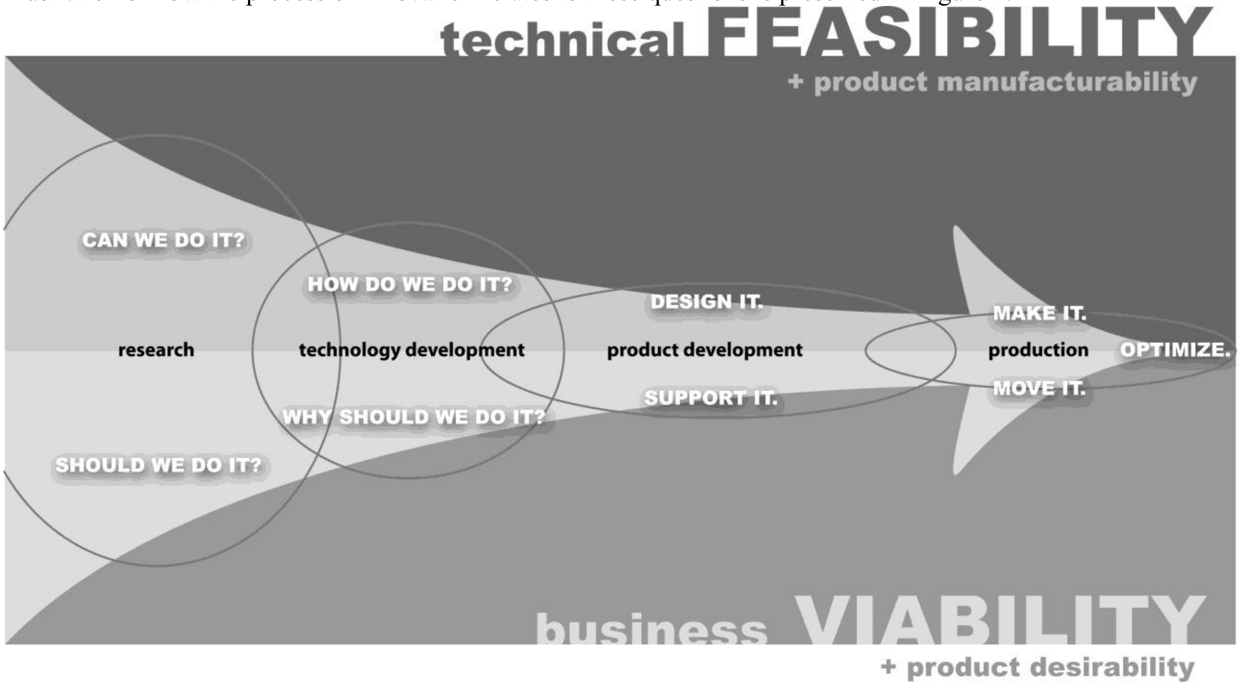

Fig. 1. Product development process. (c) Cooper Perkins Inc.

Let us suppose that the preceding definition of innovation is acceptable for this discussion. Now we may wish to think about relativistic measures of innovation (i.e. "that is really innovative" or "that is not so innovative"). If we consider something innovative, then we have acknowledged that a sufficient balance between user needs and technical solution has been met. But what makes one solution more innovative than another? In 1934, economist Joseph Schumpeter described innovation as a good that customers are not yet familiar with but he also suggested that innovation is a new quality of a known good [3]. However, usefulness of the innovation is missing from this discussion. The Organization for Economic Cooperation and Development (OECD) published the 92-page Oslo Manual [4], which details a rationale, methods, and outcomes of measuring technological innovation. This massive investigation relates innovation with a subjective assessment of the degree of change resulting from it as well as a somewhat qualitative assessment of the source of the innovation. However, again, the idea of usefulness is missing. It is not uncommon to relate innovation with the change that it brings and, certainly, with the perceived degree of technical wizardry embodied in the solution.

There may be a stronger proportionality between the perceived value of an innovation and the perceived difficulty in finding and defining a user need. Fulfillment of expected, or explicit, needs is a commoditized exercise. As explicit needs are easy to identify and understand, their fulfillment is thought of as more delivery than innovation. However, fulfilling those needs that are latent will surprise and delight the customer [5]. As latent needs are difficult to identify and understand, their fulfillment is thought of as more innovation than delivery. The suggestion is that innovation is not proportional to technological wizardry of the solution but rather proportional to the degree of "surprise and delight" of the user's experience. In other words, the degree of innovation is proportional to the hierarchical degree of latent needs that are sought to be fulfilled. The innovation equation does not strive to maximize either side of the equation at the probable expense of the other. The innovation equation strives to suitably balance the technical solution with the user's need.

It is with this notion of balancing the innovation equation that we will now discuss the brief and recent history of untethered power-measurement on a bicycle. The following case study will demonstrate that the simultaneous developments of a user need and a technical solution combined to create an innovative user experience. The entrepreneurial efforts of individuals striving to balance user needs with technical solutions resulted in an exciting story that exemplifies the process of innovation.

2. Case study

As a competitive cyclist and an engineering student in Germany in the mid-1980s, Ulrich Schoberer was frustrated that there was no way to accurately and consistently measure his fitness. Bicycle speed was subject to wind, road grade, and terrain. Heart rate was subject to current health, fatigue, and diet. Neither measure provided an accurate and precise measure of his performance or of his fitness. Power, measured in Watts, he reasoned, cuts through all of the variables that inveigle speed and heart rate as a measure of performance and fitness. In 1986, Schoberer introduced the SRM power-measuring crank for bicycles. His top-of-the-line, US$7,000 technical solution was accurate to within 1.5% of calibrated instruments and targeted university researchers and elite athletes and coaches [6]. The device served a purpose and certainly was an important first step to measuring a cyclist's power output on a bicycle, but early units looked more like something that trickled out of a laboratory rather than something that evolved from a common cycle computer (to change the batteries, for instance, users would send the unit back to Germany).

Fig. 2. SRM power meter system.

A decade later and half a world away, elite cycling coach Joe Friel wrote The Cyclist's Training Bible, in which he discussed the value and methods of training with power [7]. For similar reasons as expressed by Schoberer regarding typical performance measurements such as speed and heart rate, Friel's training programs included detailed fitness tests, training regimes, and training goals in terms of cyclists' power output. His training programs and their expected results were so compelling that many aspirational athletes were captivated by the promise of markedly improved fitness and performance. If Joe Friel had asked his charges what they wanted, they would have said faster bikes. Coach Friel created, by way of his new training program based on power, a new vehicle to make faster cyclists. The answer was not: "Ride faster". The answer was: "Train different". The problem, however, was that Friel had a compelling training experience for aspirational racing cyclists but, at US$7,000 for the SRM, there was not yet a way to get the available technology to match the available market.

It is at this point that we clearly had the establishment of two important threads to the innovation equation. With his strain gauge-based, power-measuring technology, Ulrich Schoberer clearly answered, in the affirmative, the question: “Can we do this?” With his cyclist training program based on power, Joe Friel answered, in the affirmative, the question: “Should we do this?” Now we had an intriguing technology priced well outside of the consumer market and an alluring training program based on essentially unavailable technology. These important first steps opened the door for US-based Tune Corporation to take an important second step in this market with the development and introduction of the US$700 Power-Tap power-measuring cycle computer that matched the accuracy and functionality of the top of the line US$7,000 SRM device. Introduced in 1999, the Power-Tap’s strain gauge-based, rear hub-mounted technology allowed for a significant reduction in cost (1/10 of the SRM device) thereby opening up a market of aspirational cyclists not previously available to SRM.

Fig. 3. Power-Tap power meter system

If the objective was a consumer product to reach aspirational cyclists serious about training improvements, the work done by Schoberer and Friel were critical inputs to the technology and business development efforts undertaken Power-Tap’s creators. Since then, the Power-Tap was acquired by Saris Group (USA), which has developed the product line to serve a growing market estimated at 15,000 units per year [8]. Other elite coaches and physiologists have contributed to training programs using power-measurement.

3. Summary

Schoberer and Friel created significant disruptions: Schoberer with his technology and Friel with his identification of a latent need. Both were early, important steps but, before 1999, miles apart from one another. The Power-Tap did bridge the gap significantly but the story did not end there. As both SRM and Saris continue to refine the balance between what are now more explicitly stated user needs and continually evolving technology, other companies such as Polar, Quarq, Ergomo, and iBike continue to search for a suitable balance between user needs and technology in the power-measuring cycle computer market. Until a disruptive technologist finds a way to reduce the cost of accurate power measurement on a bicycle by an order of magnitude or a ground-breaking coach develops a completely different and effective way of training cyclists, we will continue to see refinement in the balance of the innovation equation in this fairly new market.

The popular term disruptive technology [9] is misleading. It suggests that technology can be invented, acquired, or licensed to effect great change in the market. However, it does not suggest the possibility that research or insight into user needs, irrespective of the technology ultimately selected to deliver on those needs, may be contributing determinants. In his popular book, The Innovator’s Dilemma [10], author Clayton Christensen replaced the term disruptive technology (a term he originally coined) with disruptive innovation. We should consider that it is not technology alone that delivers impact but also enabling business practices and strategy. Let us not be overlyindulgent in believing that the sole source of disruptive innovation comes from the engineers and marketers of innovative companies extrapolating prescient visions of the future. Let us consider the possibility that disruptive innovation may be interpolated from companies' visions of the future as well as from their customers' sometimes well-concealed needs.

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